Amendments to the Specification

After the title and before "Field of the Invention" on Page 1 of the Specification please insert the following paragraph as follows:

-- Cross-Reference to Related Applications

The present application is a §371 continuation of International Patent Application No. PCT/AU2004/000701, filed on May 26, 2004, which, in turn, claims the benefit of U.S. Patent Application No. 10/445,462, filed May 27, 2003, currently pending under 35 U.S.C. § 120.--

Please amend the paragraph at page 3, lines 4-9 of the specification as follows:

A technique which has been ~~commonly~~ used to suppress feedback in public address systems is a frequency shift, in which the input signal is altered by a few Hertz prior to being output at the receiver. This approach has not been particularly successful in hearing aids because a large frequency shift is required to achieve a significant increase in gain. In hearing aids, the distance between microphone and receiver is much smaller than in public address systems, and thus a feedback signal with only a small frequency shift may still be relatively closely in phase with the input.

Please amend the paragraph at page 3, lines 10-17 of the specification as follows:

Signal phase can also be altered by using a time-varying delay[1]. While this can provide 1-2dB of additional useable gain, it can also result in an audible 'warbling' effect. All pass filters have also been used to modify the phase response of the feedback loop, but it can be difficult to achieve satisfactory phase at all frequencies. Methods have been proposed to push danger regions in the phase response to frequencies outside the primary audio range where suppression can be applied without loss of sound quality [2] [3]. These techniques still assume that the feedback path is constant however~~, and no suggestion has been made that an adaptive implementation may be developed~~.

Please amend the paragraph at page 4, lines 9-15 of the specification as follows:

Nearly all of the techniques discussed ~~here~~ in the preceding require some knowledge of the frequency of oscillation. However, as a result of the nature of direct and multiple reflected

acoustical paths between microphone and speaker (or the changing acoustic properties of the ear/ear mould/hearing aid coupling with regard to hearing aids) the frequency of acoustic feedback is unpredictable and may extend over a substantial portion of the audio frequency spectrum (between 20 and 20,000 Hz). As a result, it is desirable to have a circuit that can quickly identify an oscillation and its frequency.

Please amend the paragraph at page 4, lines 16-19 of the specification as follows:

US Patents 4,232,192 and 4,079,199 propose systems using a phase locked loop (PLL) adapted to recognize an oscillation when it occurs. ~~As is known, h~~However, when the input signal falls off, a PLL tends to become unstable and to drift. The result of the drift is an undesirable periodic, acoustic noise signal.

Please delete the paragraph at page 4, lines 25-27 of the specification.

Please amend the paragraph at page 4, line 29 to page 5, line 5 of the specification as follows:

The invention provides, in accordance with a first aspect, a method of identifying oscillation in a signal due to feedback, the method comprising ~~the steps of~~:

converting the signal at each of a series of successive time windows into the frequency domain;

calculating for each of a plurality of frequency bands the change in signal phase from a time window to a subsequent time window; and

comparing, for some or all of said frequency bands, the results of the calculation step to one or more defined criteria to provide a measure of whether oscillation due to feedback is present in the signal.

Please amend the paragraph at page 5, lines 11-16 of the specification as follows:

Preferably, the method ~~includes the step of~~ further comprises calculating, for some or all of said frequency bands, the change in signal amplitude from a time window to a subsequent time window, and comparing the result of the further calculation step to one or more further defined criteria, to provide a further measure as to whether oscillation due to feedback is present in the signal. This ~~step~~ calculation can be used to provide an additional level of discrimination.

Please amend the paragraph at page 5, lines 17-21 of the specification as follows:

In one form of this first aspect of the invention, for use in a system involving deriving gain values for said frequency bands in accordance with a specified signal processing algorithm, the method may ~~include the step of~~comprise comparing, for some or all of said frequency bands, the derived gain with a prescribed gain limit, in order to provide a further measure as to whether oscillation due to feedback is present in the signal.

Please amend the paragraph at page 6, lines 8-10 of the specification as follows:

If signal amplitude monitoring is employed, the method may ~~include the step of~~further comprise, for each frequency band, for each time window, comparing the amplitude from at least a previous window with that of the current window to calculate a change in amplitude.

Please amend the paragraph at page 6, lines 15-16 of the specification as follows:

The value of M_p and/or M_a may be~~is~~ selected as appropriate, dependent on the specific application and the level of sensitivity required to achieve the desired performance.

Please amend the paragraph at page 6, lines 21-25 of the specification as follows:

The suppression technique employed may ~~include the step of~~ comprise adding a random phase to the signal in at least one of said frequency bands for a prescribed period of time.
Alternatively, the suppression technique may be selected from the group of: applying a phase shift; applying a notch filter; subtracting a signal from the input signal; and applying a gain attenuation.

Please amend the paragraph at page 6, lines 26-29 of the specification as follows:

The above-described oscillation detection method may be applied to a feedback management system for a signal processing apparatus incorporating selectively adjustable or settable signal gain values, whereby the ~~steps of~~ comparing, calculating and comparing are carried out as part of a setup phase, in order to set or adjust said gain values.

Please amend the paragraph at page 6, line 30 to page 7, line 8, as follows:

The invention provides, in accordance with a second aspect, an apparatus for identifying oscillation in a signal in a system having an input transducer and an output transducer, comprising:

means for converting the signal into the frequency domain;

means for analysing the converted signal at each of a succession of time windows over a number of frequency bands, to determine the amplitude and phase of the signal in each frequency band;

means for calculating the change in signal phase for each frequency band from a time window to a subsequent time window; and

means for comparing the change in phase with one or more defined criteria to provide a measure of whether oscillation is present in the signal.

Please amend the paragraph at page 7, lines 9-13 of the specification as follows:

Preferably, means are included for further calculating, for each of the frequency bands, the change in signal amplitude from one time window to a subsequent time window, and means for comparing the result of the further calculation ~~step~~ to one or more further defined criteria, to provide a further measure as to whether oscillation is present in the signal.

Please amend the paragraph at page 8, lines 25-27 of the specification as follows:

Embodiments of the ~~The~~ present invention may therefore provides a feedback detection system that continually monitors an input signal and may recognises the presence of an oscillation quickly and accurately.

Please amend the paragraph at page 9, lines 1-8 of the specification as follows:

In the preferred method of carrying out the invention, short samples or windows of the input signal are analysed into a number of frequency bands via a Fast Fourier Transform (FFT), the amplitude and phase of each frequency component is calculated and then checked against the following oscillation criteria:

1. The change in phase from one window to the next ~~must be~~is constant within an acceptable small variation for at least M_p successive windows.
2. (Optional) The amplitude of the frequency component ~~should be~~is increasing from one window to the next for at least M_a successive windows.

Please amend the Abstract as follows: